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ABSTRACT

This paper reports the results of using the World Wide Web and a newsgroup for two undergraduate political science courses over an eight-month period. The paper describes an educator's personal experiences with technology as an instructor of political science at the University of Illinois at Chicago (UIC). The paper examines two distinct questions: first, it explores the characteristics of the student body and how the characteristics influence classroom activities (to accommodate the special needs of the students at UIC on-line materials are necessary to serve as a "virtual teaching assistant"); and second, it explores the components of the "virtual teaching assistant" by explaining the use of these Internet technologies in the classroom. Specifically, the paper discusses the basic components of a web page, how the web page is maximized for classroom usage, and how students use the web in conjunction with the traditional classroom. Web statistics generated during the eight-month period provide empirical evidence for how students use the Web. Additionally, the paper evaluates the newsgroup usage as an alternative to classroom discussion. Contains 4 figures and 9 references. (BT)

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Virtual Teaching Assistant:

Understanding Internet Technologies and the Classroom

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> *In 1922, Thomas Edison predicted that "the motion picture is destined to revolutionize our educational system and...in a few years it will supplant largely, if not entirely, the use of textbooks." Twenty-three years later, in 1945, William Levenson, the director of the Cleveland public schools' radio station, claimed that "the time may come when a portable radio receiver will be as common in the classroom as is the blackboard." Forty years after that the noted psychologist B. F. Skinner, referring to the first days of his 'teaching machines,' in the late 1950's and early 1960's, wrote, "I was soon saying that, with the help of teaching machines and programmed instruction, students could learn twice as much in the same time and with the same effort as in a standard classroom." Ten years after Skinner's recollections were published, President Bill Clinton campaigned for a "bridge to the twenty-first century...where computers are as much a part of the classroom as blackboards."*
>
> —Todd Oppenheimer, "The Computer Delusion"

Introduction

As Todd Oppenheimer eloquently described in "The Computer Delusion," education has been promised the benefits of technology three times before in this century. However, each time, the motion picture, radio, and television failed to deliver on their promises to help *students learn twice as much in the same time and with the same effort.* Despite the obvious failures of technology to improve education, the country has again turned to a technological solution to increase learning.

Since the election of President Clinton, the "web" and the information superhighway have gained national prominence. It is widely thought that the "information superhighway" is the road to success in the twenty-first century. In the last decade, billions of dollars turned a Defense Department research project into the technological phenomenon of our time. The Internet is the symbol of this already declared prosperity and enlightenment in the information age. Email,

newsgroups, and the worldwide web (www) are touted as technological innovations that will revolutionize commerce, culture, and education. Despite warnings from the past and little empirical support, government, school administrators and teachers have willingly embarked on the "information superhighway."

Since the worldwide web is expected to positively impact education, colleges and universities invest heavily in computer resources. For instance, at the University of Illinois at Chicago, forty departments provide online course information for 181 courses. Students access the Internet through public labs that boast over 1,200 PC's and Macs. Though it is generally assumed that Internet technologies can be integrated into the classroom, little research has been conducted on how the web is actually used in a classroom environment.

Given that there is much discussion of the value of the worldwide web and newsgroups, it is important to understand the impact of Internet technologies in the classroom. To gauge the overall impact of Internet technologies, I report the results of using the worldwide web and a newsgroup for two political science courses over an eight-month period. In this paper, I describe my own experiences with technology as an instructor of political science at the University of Illinois at Chicago (UIC). I examine two distinct questions. First, I explore the characteristics of the student body and how the characteristics influence classroom activities. I found that in order to accommodate the special needs of the students at UIC, on-line materials are necessary to serve as a "virtual teaching assistant."

Secondly, I explore the components of the "virtual teaching assistant" by explaining the use of these Internet technologies in the classroom. Specifically, this paper discusses the basic components of a web page, how the web page is maximized for classroom usage, and how students use the web in conjunction with the traditional classroom. Web statistics generated during an eight-month period provide empirical evidence for how students use the web. Additionally, this paper evaluates newsgroup usage as an alternative to classroom discussion.

The Students at the University of Illinois at Chicago

At the Chicago campus of the University of Illinois, it is an accepted part of UIC's mission to provide educational opportunities for students who wish to remain in the Chicagoland area. Originally chartered to service working Chicago students, UIC has evolved gradually into a Research I university whose students are likely to attend full-time. Still, a large portion of the student body maintains significant responsibilities off campus and may not view their classroom responsibilities as primary.

UIC started as a commuter campus located along Chicago's lakefront and is now strategically located at the nexus of three major interstate highways. Most students at UIC still commute long distances. In my classes, 86% of the students lived off campus and 49% traveled each day over 10 miles each way to reach campus. This can translate into one-way commutes of over an hour or more each day. Students frequently arrive late because of traffic, public transportation delays, or weather. As one expects, absenteeism and tardiness result in lost

valuable classroom time, missed assignments or announcements, and cause significant disruptions to the classroom environment.

The impact of long commute times may be seen most clearly in the differences in failure rates for three different sections, each taught by the same instructor using the same materials, but scheduled at distinctly different times of the morning. Students enrolled in classes scheduled during peak rush hours failed the class far more regularly than did students taking the course in the late morning. The failure rates for the 8 and 9 am sections were 21.9% and 17.9% respectively. The failure rate for the 11 am section was much lower at 11.7%. Attendance and attentiveness are both factors affecting the success rate of students, and both of these factors are negatively influenced by the high number of students commuting each day through rush-hour traffic.

In addition to long commutes, UIC students are also very likely to have other significant commitments outside of class. Over half of the students in the data set were employed off-campus at least 10 hours per week, while 23% were employed more than 20 hours a week and 4% worked more than 30 hours per week. Perhaps reflecting students' outside work responsibilities, only 40% of my students had scheduled a full course load. This is significantly lower than the national average of 59% as reported by the Department of Education (Chronicle of Higher Education, 1997). Additionally, just over 10% were married and slightly more than 30% claimed to have primary responsibility for children in their households. Based on these data, it is no wonder that when I asked students to

name their occupation, I found that less than 60% of the students classified their primary occupation as students.

Students' external commitments challenge the instructor at UIC. UIC students also carry numerous commitments outside of class, including work, family, and children. The students juggle course work with other commitments. Additionally, commuting impacts attendance, tardiness, and attentiveness, and ultimately student performance. In short, one must not simply teach the material, but one must also accommodate the special needs of UIC students.

Accommodation through Technology

To overcome some of the challenges posed by the distinct characteristics of the students, I took several steps. First, to stimulate class attendance and to make the lectures and discussions more useful, I used multimedia to deliver lectures. Through multimedia presentations, lectures integrated political video and audio clips, political cartoons, and bulletized information. Using a laptop computer and projector, I could take practically anything available on the Internet or video and incorporate it directly into the class lecture. Thus when speaking about a particular document, historical event, or a speech, I could splice pictures, video footage, or audio clips that would run simultaneously with the lecture content that highlighted key definitions and concepts.

Based on students' comments, integrated lectures provide visualizations that facilitate learning. It is important to note, however, that the visualizations need not project from a multimedia projector. An overhead projector, video player

and monitor, or audio devices provide similar output and impact on students. From the students' perspectives, the projection provides the necessary organization and structure that facilitates note taking. The fact that this structure can be provided through non-multi-media means may be disconcerting to those that praise multimedia. However, from the student's perspective there is not much difference between a $6,000 LCD projector and a $200 overhead projector.

From the course management standpoint, the multimedia projector does have some advantages (Harknett and Cobane, 1997), Mainly; the use of Microsoft PowerPoint provides greater flexibility and clarity. Lectures can be updated minutes before and even during their delivery. Additionally, the dynamic qualities of computer generated lectures facilitate distribution to other media, such as the Internet. It is doubtful that the cost of the equipment justifies its minimal classroom value.

Second, I posted class materials, including on-line practice exams, lecture notes, and class assignments on the Internet and instructed students to check the site frequently. The worldwide web site was designed to assist students who traveled the farthest distances or whose outside commitments presented serious burdens on their participation. I found the web provided students the materials they needed, and more importantly, when they needed it. To gauge the value of web materials, I measured usage of my worldwide web site over an eight-month period. The results of which will be soon explored.

Finally, to overcome the inherent problems of having discussion in a large class with 160 students, I required student participation on a newsgroup. The

newsgroup, open to only students enrolled in the course, gave students an opportunity to communicate with each other. Students were required to post to the newsgroup twice per week for eleven weeks during the semester. Posts could be questions, responses to other students' questions, or targeted comments about politics. If volume is any measure of success, then the newsgroup can be considered successful. By the end of the semester, there were over 4200 posts or nearly 700 more than the expected 3520 posts from 160 students posting twice per week for eleven weeks. The average number of posts (24) by participating students exceeded expectations.

The World-Wide Web and the Classroom

In the last five years, the number of web pages has skyrocketed. Today, there are over tens of millions of web pages. The web is used for commerce by such darlings of Wall Street as amazon.com. The web is used to provide information by libraries, governmental agencies, and general media services. Additionally, the web has penetrated academia and is frequently used by instructors of many disciplines. At UIC, forty departments provide web materials for 181 courses. For example, faculty in art history use the web to "distribute" historical works of art. In political science, the web is used to "distribute" oral arguments of the Supreme Court, run simulations of the prisoner's dilemma, and as a resource for data. Additionally, all course web pages provide basic course information, syllabi, and appropriate links to materials on the worldwide web.

At the University of Illinois at Chicago, I use the web as a "virtual teaching assistant" who is available twenty-four hours a day, seven days a week. At their convenience, students can access their grades, download lecture notes, and take practice exams on-line. Additionally, students can obtain course syllabi, assignments, and the resources to complete classroom assignments. Because the worldwide web is public, my homepage can be accessed from anywhere in the world. In fact, over 25% of access to my web page originated from outside the university.

Web Page Basics

When one considers the unlimited potential of the web, it is a daunting task to create a personal homepage. Generally speaking, a good web page limits file sizes by excluding unnecessary graphics to maximize access times, provides a straight forward layout that is easy to navigate, and offers the audience something useful, and hopefully unique. Because the web is a dynamic medium, my webpage has evolved during the past two years. At first, the page contained some basic biographical information, course outlines, and relevant links. Today, my web page stores my curriculum vitae, an on-line application for a special course I teach, and comprehensive assignments and resources to complete the assignments. My web page is slowly shaping into a personal library where I am curator, exhibitor, and user.

My web page is arranged into four areas: personal information, course information, on-line resources, and communication. Personal information is

designed to give students an idea of who their instructor is. The personal information includes curriculum vitae, a set of teaching evaluations, and my teaching philosophy. Course information contains course syllabi, assignments, class notes, practice exams, and grades. On-line resources are an abbreviated list of resources designed to complete course assignments. I found this section especially beneficial because I could list web sites as direct references for a particular assignment. The final section of the page consisted of a mechanism to communicate with students. The communication section contained a web-based form mail system that allowed students to email me directly over the web without having to log into their computer accounts. In the future, this section will contain an "announcements" section that will contain important class announcements.

Web Statistics

Because I want my web page to be tailored to my audience, I monitor access to files on my page. Web servers maintain a log of all accesses. All one needs to do is find the records for the page of interest, and aggregate the data. This can be done once a day, which results in interesting data on the number of hits per day, which files got hit, and from which domains the accesses originated. The computer center at UIC adapted wwwstat, written by Roy Fielding, at UC Irvine to accomplish the easy compilation of web statistics. Webstat is a program that automatically analyzes the http logs, and generates reports of the accesses to web pages. Because webstat is placed in the top directory of the set of web directories, it provides a report for that directory and all subdirectories.

Webstat is run automatically when once a day, the system finds a .webstat file, runs the analysis, and leaves the report in an html "current" file. When webstat finds an existing report file the next day, it automatically updates the "current" file, thereby extending the report for another day. On the last day of the month, webstat renames the "current" file to a report for that particular month. Presented below, is data collected over an eight-month period (September, 1997 through April 1998) at the University of Illinois at Chicago.[1]

Web Statistics and Analysis

Generally, the web page was used extensively. During the eight-month period, an average of 456 files were transmitted daily or nearly 15,000 accesses per month or 120,000 files during the eight-month period. In real terms, this means the web page answered students' questions 120,000 times during an academic year. As one would expect, usage of the web peaked near assignment due dates and scheduled exams. Figure 1 depicts average daily file requests. With the exception of September and October[2], average daily usage is stable at approximately 465 requests per day.

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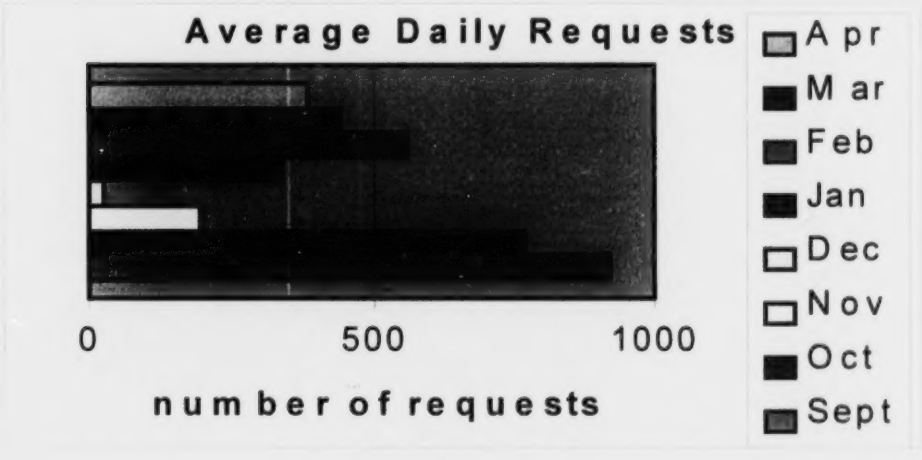
1 The data was compiled using a unix-based resident web statistics program called webstat.

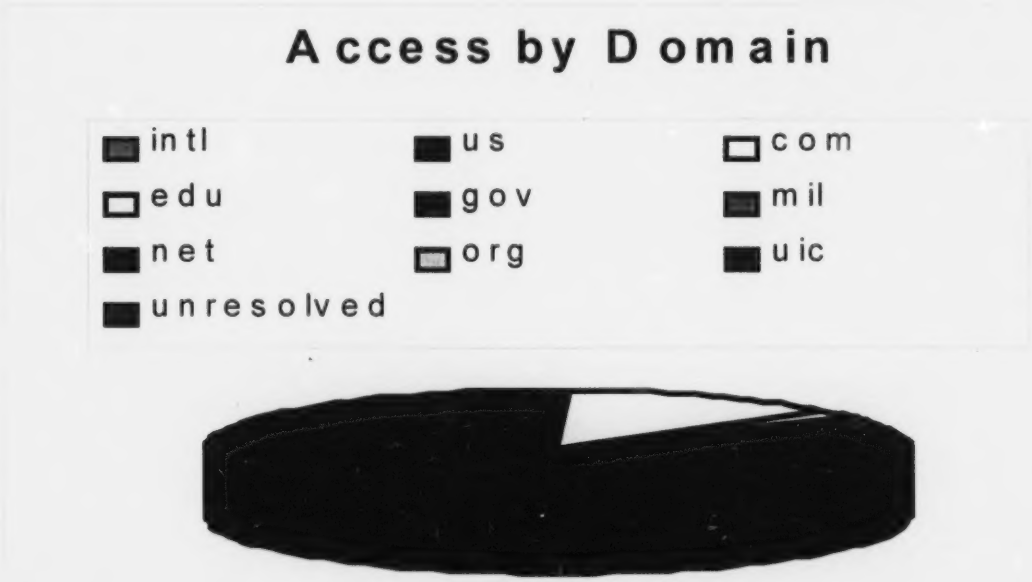
2 Usage during September and October is undoubtedly due to the number of students enrolled in fall semester who used my web page. During the fall, there were approximately 350 students, while in the spring, there were only 180 students.

Figure 1: Average Daily Requests



Though the overwhelming majority of requests originated from the resident domain (uic), 26% of access requests originated from outside of the university. See figure 2 below. This obviously reflects the proliferation of home computers and the popularity of commercial Internet service providers such as AOL or MSN. In addition to commercial internet service providers (13%), there was surprisingly a number of hits from international domains (1%) (UK, South Africa, UAE, and others), hits from governmental and military domains (1%), and hits from non-profit organizations (6%). Undoubtedly, the external access of the web is indicative of the web's proliferation as a global medium.

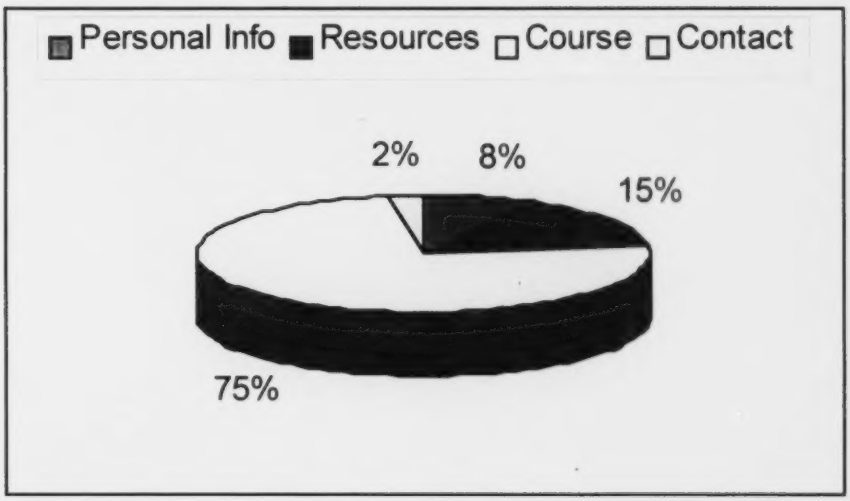
Figure 2: Access by Domain



As figure 3 depicts, web materials that were directly relevant to the course such as course information (75%) were most widely used. Course information consisted of syllabi, assignments, lecture notes, practice exams and grades. Resources and personal information were visited as frequently as each other (15%). Course resources consisted of a guide to writing and Internet political resources, while personal information included course evaluations, my curriculum vitae, and my teaching philosophy. At first glance instructor-student communication accounts for only 2%, however, it must be remembered that this is communication through the worldwide web. The contact variable does not

include email sent directly to the instructor. Though I did not document the number of emails I received during the eight-month period of this data, I know that a received upwards of ten emails a day from students. If the anecdotal is extrapolated and compared in terms of the web usage, email communication would rank second at 20%.

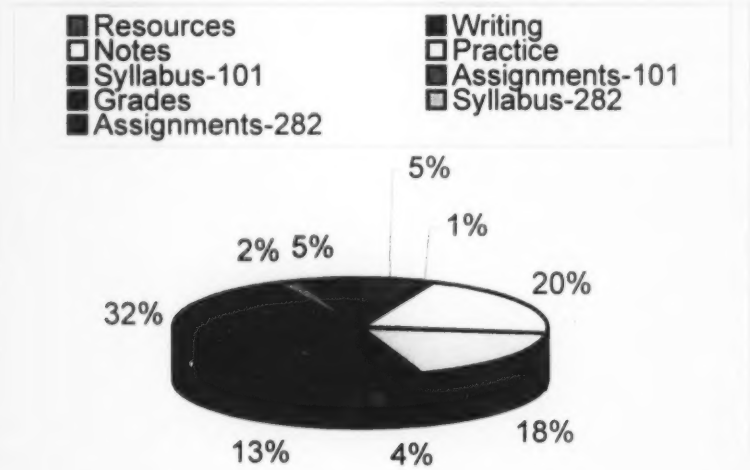
Figure 3: Web Usage by Students



A more detailed analysis of the course resources on the web page, revealed that grades (32%), lecture notes (20%), and practice exams (18%) are the three most popular areas. Additionally, figure 4 illustrates that assignments for the 101 class (13%), online resources (internet links) accounted for 5% of the hits, while a guide to writing accounted for only 1% of hits. These data suggest that students are more likely to use online resources that provide immediate benefits (grades, lecture notes, and practice exams), as opposed to resources

that require further exploration such as links, or provide general assistance such as a guide to writing.

Figure 4: Course Resource Usage



Newsgroup Data and Analysis

A newsgroup is an on-line topic-oriented discussion group. At this writing, there are over 7,000 active newsgroups inn the Internet. Newsgroups range in topics from groups centered on the computer profession (.comp) to groups that discuss recreation (.rec) and social groups (.soc) and groups that exist for courses (.class). Participants post messages, questions, or comments to a newsgroup to which others respond. Unlike "chat rooms," newsgroup posts are not real time. Posts remain on servers for at least thirty days and allow anyone to respond to the posts.

The newsgroup is especially useful in large lecture courses. In a course with over 160 students, comprehensive discussion is not feasible. Because the course did not offer small discussion sections and I want to encourage discussion in my classes, the newsgroup was the only alternative available to me. The university computer center established a newsgroup exclusive to students in Political Science 101 (alt.class.uic.pols101). Though people not enrolled in the newsgroup could access and post to it, the topical nature prevented the infiltration of visitors from the outside.

All students were required to participate in the newsgroup throughout the semester. All newsgroup posts are non-anonymous, which facilitated grading. As a general rule, students were required to post to the newsgroup twice per week. Though I did not specify the types of posts, students generally commented about topics from the course, items of political interest from the media, or news from around campus. On the newsgroup, students frequently raised points from lecture and discussed them with their classmates. Additionally, news events or other interesting items were posted to the newsgroup. Generally, students were polite on the newsgroup; however, one student was especially discourteous to others. While affirming the discourteous student's right to free speech on the Internet, the discourteous student was reminded that the rules of the classroom apply to the newsgroup. Plainly, things that wouldn't be said in the classroom shouldn't be said in the newsgroup.

Despite technological challenges for some students, the newsgroup was quite active. Out of 180 registered students, 138 students (77%) participated

regularly. Of the 42 students that did not participate, I suspect that technophobia and external commitments prevented participation. The rate at which students participated widely varied. The range was 1 to 147. On average, students posted 24 times during the semester. Though students did not receive credit for posts over 24, many students exceeded the minimum. This suggests that the newsgroup was fun and interesting enough for students who were shut out from participating in class.

Student comments suggest that the newsgroup was beneficial. Many students were grateful they had an opportunity to discuss issues and engage other students on political topics. It seems that the newsgroup broke through the isolation created by large lecture-based courses. The newsgroup was especially valuable to the student who is afraid to speak in public. It seems the keyboard provided adequate expression for the shy voice. As discussed above, discourtesy can result from students' increased confidence behind the keyboard. Like many things on the Internet, the students found the anarchic nature of the newsgroup frustrating. They felt, too often, that uninteresting topics dominated discussions. To prevent the degeneration of the newsgroup and provide structure, I plan to provide weekly prompts that will focus discussion on course topics. Ideally, one would also moderate the newsgroup closely; however, a group with 400 posts per week is generally too much for one person to moderate.

Additionally, many students were grateful for being forced to get "on-line." Despite general stereotypes, college students are not fully computer literate. During the first several weeks of the semester, it was necessary to teach

students how to use the Internet and to post to the newsgroup. In the future, I plan to reserve course time for basic computer training.

Conclusions and Recommendations for Future Research

The research suggests that teaching in an urban environment presents challenges. Included in these are the problems created when students commute long distances, when students work long hours outside of school, and when students must balance family obligations with classroom responsibilities. Though the challenges are many, they are not insurmountable. The web and the newsgroup proved to be effective means to encourage participation and interest in the course.

With the audience in mind, I improved my effectiveness as an instructor by using multimedia in the classroom and Internet technologies outside of the classroom. With current technology, instructors can easily incorporate video and sound into traditional lectures, even to the point of using computer-based presentations to seamlessly integrate different media within lectures. I use Microsoft PowerPoint and an LCD projector to accomplish this. Though this has limited direct educational value, it does help to capture students' otherwise divided attention. Additionally, I use the Internet throughout the course to communicate with students, to provide students with a virtual teaching assistant 24 hours day, and to facilitate discussion of political topics by using a newsgroup. I found that the web is widely used throughout my course (120,000 times in an

eight-month period!) and that the newsgroup is effective in providing every student an opportunity to speak (over 4,200 posts in one semester!).

The inquiry suffers from certain limitations, which I hope to address in future research. First, I need a more thorough measure of each of the variables discussed in this study. As discussed above, it took several permutations of the web page before I was happy with its current format. To get a better understanding of how students use a course web page, it would be important to have a stable web page design over time. Second, I would like to have more data on students' computer habits. Namely, how much time students spend on the web, how they use the web outside of the course, and their perceptions of the web. Third, I would like to have correlations between grades and student use of the web in the classroom. Finally, I would have liked to have a better measure of quality concerning the newsgroup. I can not say whether the 4,200 posts were thoughtful and insightful comments. Though not done here, network analysis can measure both the quality and nature of discussion on a newsgroup. I am particularly interested in the extent to which students communicate with one another. Analysis of newsgroups "threads" can provide such data.

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